WHAT WE CLAIM IS:

1. A negatively charged oxygen atom production system adapted to heat a member comprising a calcium aluminate composite material for extraction of negatively charged oxygen atoms, characterized in that:

said calcium aluminate composite oxide in a thin-film form is formed on a substrate comprising a zirconia plate or yttria-stabilized zirconia, and a heater for heating said member is formed within said substrate and near the thin film comprising said calcium aluminate composite oxide.

2. The negatively charged oxygen atom production system according to claim 1, characterized in that said heater for heating is sandwiched between upper and lower substrates, each comprising said zirconia plate or yttria-stabilized zirconia.

3. A negatively charged oxygen atom production system adapted to heat a member comprising a calcium aluminate composite oxide for extraction of negatively charged oxygen atoms, characterized in that:

said calcium aluminate composite oxide in a thin-film form is formed on a substrate comprising a zirconia plate or yttria-stabilized zirconia, and a heater for heating said member is formed contiguous to, and integrally with, the thin film comprising said calcium aluminate composite oxide.

4. The negatively charged oxygen atom production system according to claim 3, characterized in that said heater for heating is formed on the substrate comprising a zirconia plate or yttria-stabilized zirconia and said calcium aluminate composite oxide is formed in a thin-film form from above.

5. The negatively charged oxygen atom production system according to claim 3, characterized in that said heater for heating is formed on a thin film of calcium aluminate composite oxide formed on said substrate comprising a zirconia plate or yttria-stabilized zirconia.

6. A negatively charged oxygen atom production system adapted to heat a member comprising a calcium aluminate composite oxide for extraction of negatively charged oxygen atoms, characterized in that:

said calcium aluminate composite oxide in a thin-film form is formed on a steatite ceramic heater substrate.

7. The negatively charged oxygen atom production system according to any one of claims 1 to 7, characterized in that a cathode is located on a back surface side of the substrate with said calcium aluminate composite oxide in a thin-film form formed thereon, and an anode is located on a side of the substrate facing away from the cathode, wherein oxygen is fed to a cathode side and a voltage is applied between the cathode and the anode for extraction of negatively charged oxygen atoms from a side with the anode located thereon.

8. The negatively charged oxygen atom production system according to claim 7, characterized in that said anode is located with a space from the member formed of the calcium aluminate composite oxide.

9. The negatively charged oxygen atom production system according to any one of claims 1 to 8, characterized in that said calcium aluminate composite oxide comprises calcium oxide and aluminum oxide in a molar ratio of 12:7.

10. The negatively charged oxygen atom production system according to claim 9, characterized in that said

calcium aluminate composite oxide has been obtained by firing calcium carbonate and aluminum oxide at a firing temperature of 1,300℃ to 1,450℃.

11. The negatively charged oxygen atom production system according to any one of claims 1 to 10, characterized in that said heating temperature is 200℃ to 1,000℃.